Potential Cost Impacts of Article XIV, "Green Building Regulations"

Overview

The convergence of heightened public demand, increasing government initiatives, rising energy costs, advances in innovation, and experienced design and construction teams has increased the frequency of green building techniques throughout the country, particularly in the Washington D.C. metropolitan region. However, there are still concerns over the expense and affordability of sustainable design. In the development of Rockville's revised City Code, Chapter 5, Article XIV, "Green Building Regulations," the City considered these financial concerns and subsequently developed a system of flexible and simplified requirements for both commercial and residential construction.

Commercial Green Building

As expertise and experience has grown, many projects are building green with little or no added costs. One of the benefits of the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) rating system is the flexibility to select the credits and measures that are most appropriate for a project. Therefore, many projects can achieve certification through the pursuit of lower cost strategies while avoiding expensive strategies. Additionally, if LEED is considered early in the development process, unnecessary costs may be avoided.

Rockville's proposed 2010 green building regulations incorporate even more flexibility than the previously proposed 2009 green building regulations. The current proposal does not require the added expenses of third party certification by the U.S. Green Building Council and building commissioning. Furthermore, the 2010 proposal requires 25 LEED points; whereas, the 2009 proposal required LEED Certification and the attainment of 40 LEED points. Many Rockville buildings will achieve some level of LEED points by virtue of their design, location, and current State and local requirements.

Given that there are various methods of meeting the proposed Rockville green building regulations, there is no 'one size fits all' answer to the question of the cost of green. However, it is assumed that the costs of meeting Rockville's proposed commercial green requirements will be *lower* than meeting the LEED Certification requirements of the U.S. Green Building Council (USGBC). Several studies have shown that there is no significant difference in the average costs for green buildings as compared to non-green buildings.[1] A 2003 study of 33 green buildings in California found that the average cost of building green over traditional methods (the "premium") was 0.66% for LEED Certified, 2.11% for LEED Silver, 1.82% for LEED Gold, and 6.5% for LEED Platinum.[2] At the local level, Montgomery County Public Schools estimated a

[1] Langdon, Davis. 2007. *Cost of Green Revisited: Reexamining the Feasibility and Cost Impact of Sustainable Design in the Light of Increased Market Adoption.* http://www.davislangdon.com/upload/images/publications/USA/The%20Cost%20of%20Green%20Revisited.pdf

[2] Kats, Greg. 2003. *The Costs and Financial Benefits of Green Buildings. A Report To California's Sustainable Building Task Force.* http://www.usgbc.org/Docs/News/News477.pdf#28

5% increase to pursue LEED certification.[3] Given that many adjacent jurisdictions already require commercial buildings of a certain size to achieve either LEED Certified or LEED Silver certification from the USGBC, the cost of Rockville's green requirements should be less than adjacent jurisdictions.

Residential Green Building

Rockville's residential green building requirements primarily incorporate the standards outlined in the ENERGY STAR Qualified Homes program. The U.S. Environmental Protection Agency (EPA) recently developed an ***illustrative*** cost comparison study[4] between a baseline home built to the 2009 IECC standard and an ENERGY STAR Qualified home built to the *proposed* 2011 ENERGY STAR Qualified Homes Package (which is more stringent than Rockville's proposed requirements).

EPA modeled a single-story detached, three-bedroom home with 2,200 square feet of conditioned floor area. The attached three exhibits are excerpted from EPA's analysis. Exhibit 1 summarizes the estimated costs and savings of meeting the ENERGY STAR requirements. The estimates associated with the homes constructed in Climate Zone 4 correspond to Rockville's location. Exhibits 8 and 9 of EPA's analysis (attached) outline the incremental costs associated with each measure required by the ENERGY STAR program for homes utilizing both electric and gas space and water heating systems. The following table summarizes the total upgrade costs and annual utility savings estimated for ENERGY STAR Qualified Homes in Rockville's climate zone.

Table 1: ENERGY STAR Qualified Homes (proposed 2011 requirements)
Illustrative Cost and Savings Summary

Home Type	Total Upgrade Cost	Annual Utility Savings
One-story home with basement and ***electric*** space and water heating system	$4,271	$435
One-story home with basement and ***gas*** space and water heating system	$3,752	$386

While actual savings and incremental costs may vary for each home, this study provides an ***illustrative*** example of the potential costs and savings that may be anticipated with Rockville's proposed residential requirements. Given that Montgomery County and Gaithersburg already require or will be requiring the ENERGY STAR Qualified Homes measures in their buildings codes, the cost of Rockville's residential green requirements should be on par with these adjacent jurisdictions.

[3] Seth Adams, Chief Mechanical Engineer, MCPS Division of Construction.
[4] ENERGY STAR Qualified Homes 2011 Savings and Cost Estimate Summary.
http://www.energystar.gov/ia/partners/bldrs_lenders_raters/downloads/2011_Savings_Cost_Summary.pdf

ENERGY STAR Qualified Homes 2011
Savings & Cost Estimate Summary

Exhibit 1: ENERGY STAR Qualified Homes 2011 Illustrative Cost & Savings Summary

							Annual Utility Bills			2011 ENERGY STAR Upgrade Cost		2011 ENERGY STAR Cash Flow Impact		
							Costs		Savings					
Home	CZ	Location	Stories	Foundation	HVAC Equipment Type	Heating Fuel	2009 IECC	2011 ENERGY STAR	2011 ENERGY STAR	Total Cost	Monthly Mortgage Cost	Monthly Utility Savings	Monthly Mortgage Cost	Net Cash Flow
1	1	Miami, FL	One-story	Slab	Air-Source Heatpump	Electricity	$1,795	$1,475	$320	$4,440	$24	$27	$24	$3
2	1	Miami, FL	One-story	Slab	Gas Furance / AC	Gas	$1,685	$1,370	$315	$4,149	$22	$26	$22	$4
3	2	Daytona Beach, FL	One-story	Slab	Air-Source Heatpump	Electricity	$1,751	$1,471	$280	$4,208	$23	$23	$23	$1
4	2	Daytona Beach, FL	One-story	Slab	Gas Furance / AC	Gas	$1,662	$1,383	$279	$3,917	$21	$23	$21	$2
5	3	Fort Worth, TX	One-story	Slab	Air-Source Heatpump	Electricity	$2,048	$1,664	$383	$4,648	$25	$32	$25	$7
6	3	Fort Worth, TX	One-story	Slab	Gas Furance / AC	Gas	$1,950	$1,573	$377	$4,356	$23	$31	$23	$8
7	4	St. Louis, MO	One-story	Basement	Air-Source Heatpump	Electricity	$2,361	$1,925	$435	$4,271	$23	$36	$23	$13
8	4	St. Louis, MO	One-story	Basement	Gas Furance / AC	Gas	$2,072	$1,687	$386	$3,752	$20	$32	$20	$12
9	5	Indianapolis , IN	One-story	Basement	Air-Source Heatpump	Electricity	$2,417	$1,889	$529	$5,090	$27	$44	$27	$17
10	5	Indianapolis , IN	One-story	Basement	Gas Furance / AC	Gas	$2,067	$1,648	$420	$3,685	$20	$35	$20	$15
11	6	Burlington, VT	One-story	Basement	Air-Source Heatpump	Electricity	$2,967	$2,192	$774	$5,387	$29	$65	$29	$36
12	6	Burlington, VT	One-story	Basement	Gas Furance / AC	Gas	$2,368	$1,810	$558	$3,824	$21	$47	$21	$26
13	7	Duluth, MN	One-story	Basement	Gnd-Source Heatpump	Electricity	$3,659	$1,875	$1,785	$8,684	$47	$149	$47	$102
14	7	Duluth, MN	One-story	Basement	Gas Furance / AC	Gas	$2,667	$1,971	$696	$3,824	$21	$58	$21	$37

*

Notes:

- Purchased energy costs were calculated assuming a national average cost of $0.11 / kWh and $1.33 / therm. The electricity rate was determined by averaging the data for 2008 from the Energy Information Administration's Average Retail Price of Electricity to Ultimate Customers, Residential Sector. The natural gas rate was determined by averaging the data for 2008 from the Energy Information Administration's U.S. Price of Natural Gas Delivered to Residential Consumers.
- Monthly mortgage cost was calculated assuming a 30-year fixed mortgage with a 5.0% interest rate.

ENERGY STAR Qualified Homes 2011
Savings & Cost Estimate Summary

Exhibit 8: Sample Home 7 - Incremental Costs for 2011 ENERGY STAR Qualified Homes vs 2009 IECC

Major Housing Characteristics

Stories	One	**City**	St. Louis, MO
Total Conditioned Floor Area (ft²)	2,200	**Climate Zone**	CZ 4
Conditioned Floor Area per Floor (ft²)	2,200	**Space Heating Fuel**	Electricity
Foundation Type	Unconditioned Basement	**Water Heating Fuel**	Electricity

Incremental Costs

Measure	Baseline Level (2009 IECC)	Efficient Level (2011 ENERGY STAR)	Unit Cost	Cost Qty	Cost Unit	2011 ES Cost
ENERGY STAR Reference Design						
Cooling Equipment	(See Heating Equipment)	(See Heating Equipment)	-	-	-	-
Heating Equipment	7.7 HSPF / 13 SEER / 11 EER ASHP; Electric Backup	8.5 HSPF / 14.5 SEER / 12 EER ASHP; Electric Backup	$263.54	4	Tons	$1,054
Radiant Barrier	No Radiant Barrier	No Radiant Barrier	-	-	-	-
Ceiling Insulation	R-38	R-38	-	-	-	-
Ceiling Insulation Installation	Grade II Installation	Grade I Installation	$0.03	2,200	Ins. Surface Area (ft²)	$56
Above-Grade Wall Insulation	R-13	R-13	-	-	-	-
A-G Wall Insulation Installation	Grade III Installation	Grade I Installation	$0.10	1,501	Ins. Surface Area (ft²)	$146
Foundation Insulation	R-19 Floor Insulation	R-19 Floor Insulation	-	-	-	-
Foundation Insulation Installation	Grade II Installation	Grade I Installation	$0.08	2,200	Ins. Surface Area (ft²)	$182
Infiltration	7.0 ACH50	5.0 ACH50	$0.25	2,200	CFA (ft²)	$550
Windows	U-value: 0.35 / SHGC: 0.45	U-value: 0.32 / SHGC: 0.40	$0.36	330	Window Area (ft²)	$119
Doors	R-2.9 Door Insulation	R-4.8 Door Insulation	$25.00	2	Door	$50
Water Heater	0.90 EF Electric DHW, 52 Gallons	0.92 EF Electric DHW, 52 Gallons	$55.00	1	Water Heater	$55
Thermostat	Programmable Thermostat	Programmable Thermostat	-	-	-	-
Duct Sealing	8 CFM per 100 ft² of CFA	4 CFM per 100 ft² of CFA	$100.00	2.2	1,000 CFA (ft²)	$220
Duct Insulation	R-8 Attic, R-6 Other Uncond. Spaces	R-8 Attic, R-6 Other Uncond. Spaces	-	-	-	-
Dishwasher	Standard Efficiency Dishwasher	ENERGY STAR Dishwasher	$0.00	1	Dishwasher	$0
Refrigerator	Standard Efficiency Refrigerator	ENERGY STAR Refrigerator	$30.00	1	Refrigerator	$30
Ceiling Fans	Standard Efficiency Ceiling Fans	ENERGY STAR Ceiling Fans	$86.00	2	Ceiling Fans	$172
Lighting	50% Fluorescent Lighting	80% ENERGY STAR CFLs	$2.80	13	Lamps	$37
Bathroom Exhaust Fans	Standard Efficiency Exhaust Fans	ENERGY STAR Exhaust Fans	$25.00	2	Exhaust Fans	$50
ENERGY STAR Checklists						
Thermal Enclosure System - Rater						$350
HVAC Sys. Quality Install. - Contractor						$800
HVAC Sys. Quality Install. - Rater						$200
Water Management System Checklists						$200
					Total Incremental Cost for Home	**$4,271**

ENERGY STAR Qualified Homes 2011
Savings & Cost Estimate Summary

Exhibit 9: Sample Home 8 - Incremental Costs for 2011 ENERGY STAR Qualified Homes vs 2009 IECC

Major Housing Characteristics

Stories	One	**City**	St. Louis, MO
Total Conditioned Floor Area (ft²)	2,200	**Climate Zone**	CZ 4
Conditioned Floor Area per Floor (ft²)	2,200	**Space Heating Fuel**	Gas
Foundation Type	Unconditioned Basement	**Water Heating Fuel**	Gas

Incremental Costs

Measure	Baseline Level (2009 IECC)	Efficient Level (2011 ENERGY STAR)	Unit Cost	Cost Qty	Cost Unit	2011 ES Cost
ENERGY STAR Reference Design						
Cooling Equipment	13 SEER Central AC	13 SEER Central AC	-	-	-	-
Heating Equipment	80 AFUE gas furnace	90 AFUE gas furnace	$8.67	64	kBtu/h	$555
Radiant Barrier	No Radiant Barrier	No Radiant Barrier	-	-	-	-
Ceiling Insulation	R-38	R-38	-	-	-	-
Ceiling Insulation Installation	Grade II Installation	Grade I Installation	$0.03	2,200	Ins. Surface Area (ft²)	$56
Above-Grade Wall Insulation	R-13	R-13	-	-	-	-
A-G Wall Insulation Installation	Grade III Installation	Grade I Installation	$0.10	1,501	Ins. Surface Area (ft²)	$146
Foundation Insulation	R-19 Floor Insulation	R-19 Floor Insulation	-	-	-	-
Foundation Insulation Installation	Grade II Installation	Grade I Installation	$0.08	2,200	Ins. Surface Area (ft²)	$182
Infiltration	7.0 ACH50	5.0 ACH50	$0.25	2,200	CFA (ft²)	$550
Windows	U-value: 0.35 / SHGC: 0.45	U-value: 0.32 / SHGC: 0.40	$0.36	330	Window Area (ft²)	$119
Doors	R-2.9 Door Insulation	R-4.8 Door Insulation	$25.00	2	Door	$50
Water Heater	0.59 EF Gas DHW, 40 gallons	0.61 EF Gas DHW, 40 gallons	$35.00	1	Water Heater	$35
Thermostat	Programmable Thermostat	Programmable Thermostat	-	-	-	-
Duct Sealing	8 CFM per 100 ft² of CFA	4 CFM per 100 ft² of CFA	$100.00	2.2	1,000 CFA (ft²)	$220
Duct Insulation	R-8 Attic, R-6 Other Uncond. Spaces	R-8 Attic, R-6 Other Uncond. Spaces	-	-	-	-
Dishwasher	Standard Efficiency Dishwasher	ENERGY STAR Dishwasher	$0.00	1	Dishwasher	$0
Refrigerator	Standard Efficiency Refrigerator	ENERGY STAR Refrigerator	$30.00	1	Refrigerator	$30
Ceiling Fans	Standard Efficiency Ceiling Fans	ENERGY STAR Ceiling Fans	$86.00	2	Ceiling Fans	$172
Lighting	50% Fluorescent Lighting	80% ENERGY STAR CFLs	$2.80	13	Lamps	$37
Bathroom Exhaust Fans	Standard Efficiency Exhaust Fans	ENERGY STAR Exhaust Fans	$25.00	2	Exhaust Fans	$50
ENERGY STAR Checklists						
Thermal Enclosure System - Rater						$350
HVAC Sys. Quality Install. - Contractor						$800
HVAC Sys. Quality Install. - Rater						$200
Water Management System Checklists						$200
			Total Incremental Cost for Home			$3,752